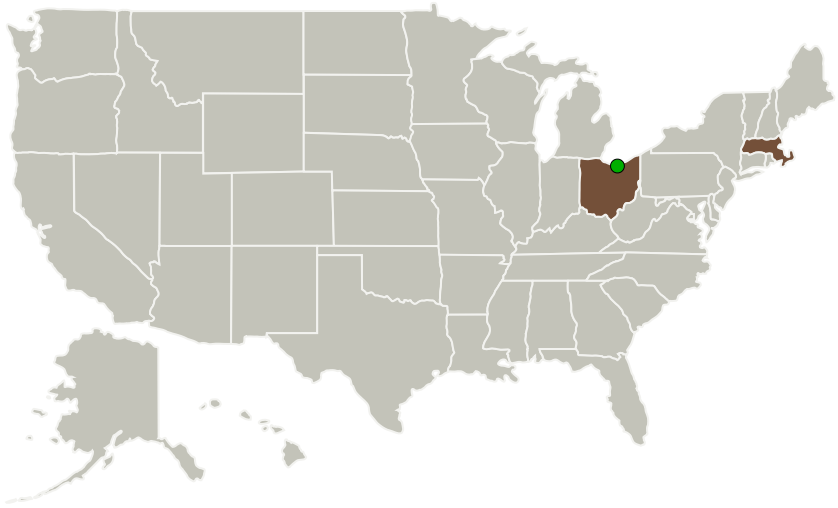
Ultracapacitor Based Power Supply for CubeSats, Phase II

Completed Technology Project (2017 - 2018)

Project Introduction

Traditionally, the relatively small surface area and volume of a cube satellite has restricted the practical power limit of cube satellites. To the extent that the power will be generated by solar panels, cube satellites have a limited round trip energy budget. Increasing solar panel efficiency and complexity alleviates the energy issue to some degree. Both however, occur at the expense of the original cube satellite advantages of being inexpensive, small, and reliable. As such, the objective of high power capabilities must also assume fairly short time scales in order to preserve the energy budget. It's this mode of operation, maximum energy and short high power events, where hybrid system designs typically make practical sense. In all cases, the energy storage requirements will depend on the payloads power profile and mission requirements. Cube satellite payloads are becoming more sophisticated and, in many cases, power hungry. Interesting high power payloads currently in development for small satellites include Synthetic Aperture Radar (SAR) and mechanical actuators for performing larger satellite maintenance. In order to continue the trend of increasing cube satellite capabilities, it's important to be ready with energy storage that is both capable of supplying high power and flexible to suit the range of payload possibilities. The hybrid ultracapacitor module proposed is a flexible, high efficiency, novel design that will enable satellite engineers to quickly and easily realize benefits such as extended battery lifetime, high peak power, and smaller size and weight that may be possible through a hybrid energy storage system. Additionally, the technology will translate to additional multifunctional, structural applications such as microsatellites, light aircraft, ordinance, and many more.

Primary U.S. Work Locations and Key Partners



Ultracapacitor Based Power Supply for CubeSats, Phase II Briefing Chart Image

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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
FastCAP Systems Corporation	Lead Organization	Industry	Boston, Massachusetts
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Massachusetts	Ohio

Project Transitions

April 2017: Project Start

July 2018: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140772)*

Images

Briefing Chart Image
Ultracapacitor Based Power Supply for CubeSats, Phase II Briefing Chart Image
(https://techport.nasa.gov/image/132873)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

FastCAP Systems Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

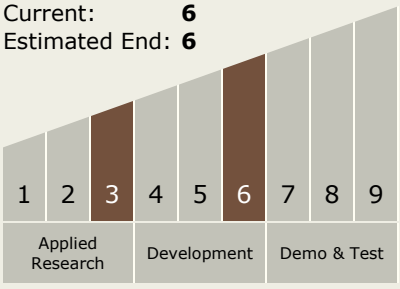
Jason L Kessler

Program Manager:

Carlos Torrez

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.3 Advanced Concepts for Energy Storage

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System